تشغيل تحضير
EXP (1): Specimen preparation for metallographic study microstructure

Sectioning → Mounting → Grinding → Polishing → Cleaning & drying → Etching

Grinding: under running water.
Cleaning: water & ethanol (boiling temp 78°C).

Grit no = # of sharp particles per square inch (unit Area).
320, 400, 600, 1200

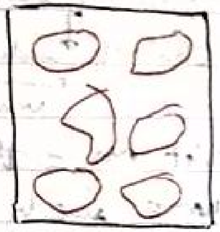
320: Rough surface (starting).
Larger → smoother surface (Ending)

1) Sectioning: cutting into specified Dimensions section

Sand Paper : ورق الزجاج / ورق الصنفرة

2) Grinding: under running water to prevent over heating

Grain Boundary: The Area between different orientations of Atom is called g. boundary.



Poor microstructure: – ① Poor performance
② Reduced life span

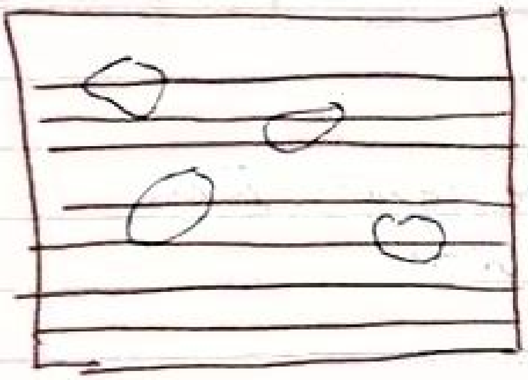
Partn air flight 394, 1989
– unaproved Air craft part
– counterfit not Authentic

③ Etching: – To make grain boundaries more visible (Dull).

Exp (2): Microstructure Examination

1- Study the micro.
2- Calculate grain size
3- Calculate carbon content

* Finding the Grain size → Intercept method



$$\text{grain size} = \frac{\text{Line length} * \# \text{ of lines}}{\Sigma \# \text{ of grain} * \text{Total magnification}}$$

$$= \frac{14.8 \text{ Cm} * 7}{\# \text{ of grains} * \text{total mag.}}$$

objective lenz = 100 X
eye lenz = 10 X
computer screen = 3 X

total mag. 3000 X

(3)

* Find ASTM grain size.

American society for Testing Materials

ISO. International Standard organization

BSI British Standard Institution.

$$N = 2^{n-1}$$

N: # of grain per square inch

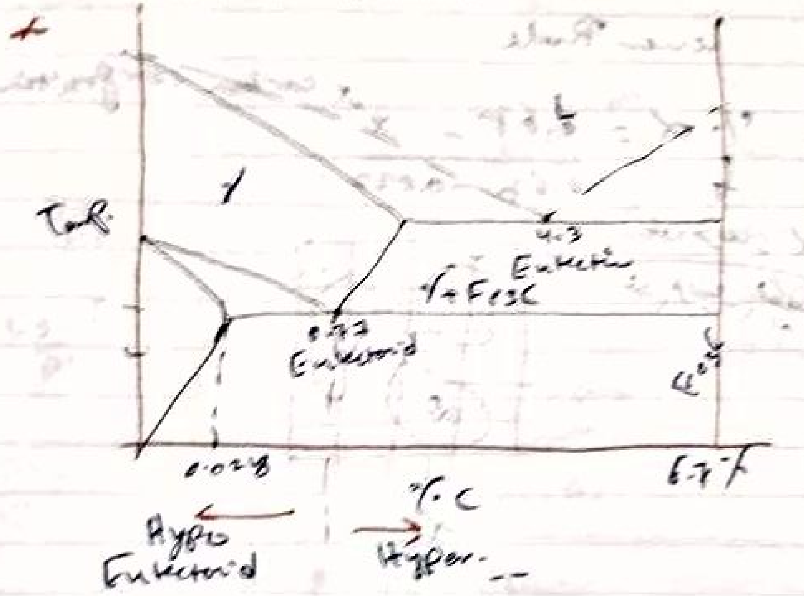
n: ASTM grain size

at mag. >100 X

$$N\left(\frac{M}{100}\right)^2 = 2^{n-1}$$

M: total magnification . مقدار تكبير

Carbon content.



α: Ferrite 0.022% , Ductile, magnetic
γ: Austenite 2.14% Ductile, non "
Cementite 6.7% carbon hard & Brittle.

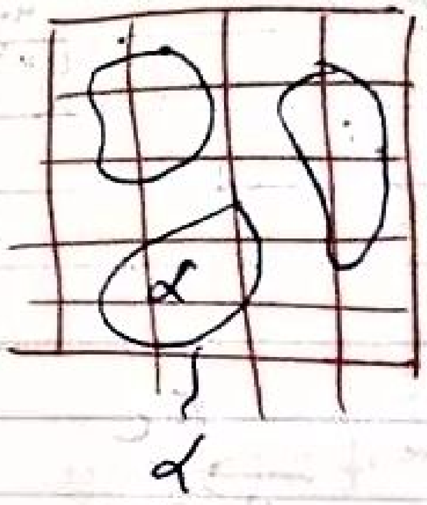
density Austenite > ferrite.

Lever Rule.

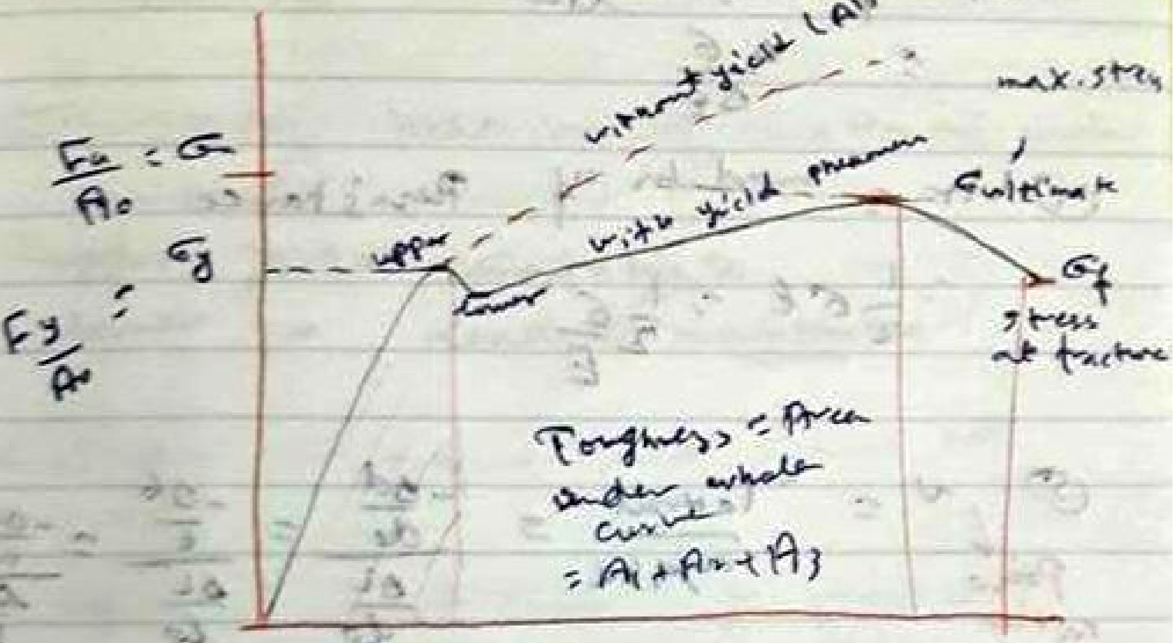
$$\%\alpha = \frac{6.67 - x}{6.67 - 0.022}$$ x's carbon composition

fr

$$\frac{\text{عدد مربعات } \alpha}{\text{عدد المربعات الكلية}}$$



Exp 4; Tensile test



$\varepsilon = \frac{\Delta l}{l}$ strain

$E = \frac{\sigma}{\varepsilon}$

- Percent reduction of Area

$$= \frac{A_0 - A_f}{A_0} \times 100\%$$

Percent of Elongation

$$\%\,el = \frac{l_f - l_0}{l_0} \times 100\%$$

(7)

(3) E = youngs modelus of Elasticity

slope of elastic line

$$= \frac{\Delta \sigma}{\Delta \epsilon}$$

(4) U_r = modulus of Resistance

$$= \frac{1}{2}\sigma\epsilon = \frac{1}{2}\frac{\sigma^2}{E}$$

(5) $\nu = \frac{-\text{lateral}}{\text{axial}} = \frac{-\frac{\Delta d}{d_o}}{\frac{\Delta L}{L_o}} = \frac{-\frac{\Delta t}{t}}{\frac{\Delta L}{L_o}} = \frac{-\frac{\Delta w}{w}}{\frac{\Delta L}{L}}$

Poiso ratio always less than 1

Brittle ~~Ductile~~: ~~when~~ ~~tan~~ when material is subjecting to ~~load~~ it will fail with small deformation

ϵ less than 5%.

Ductile: The ability of material to deform without fracture

(8) deformation ? bigger.

* The lesser E, to ductile is not the bigger E the stiffer is material

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To study behavior of material under uniaxial stresses

upper yield ~~load~~ initiate

lower " load to maintaine

Human Sulim

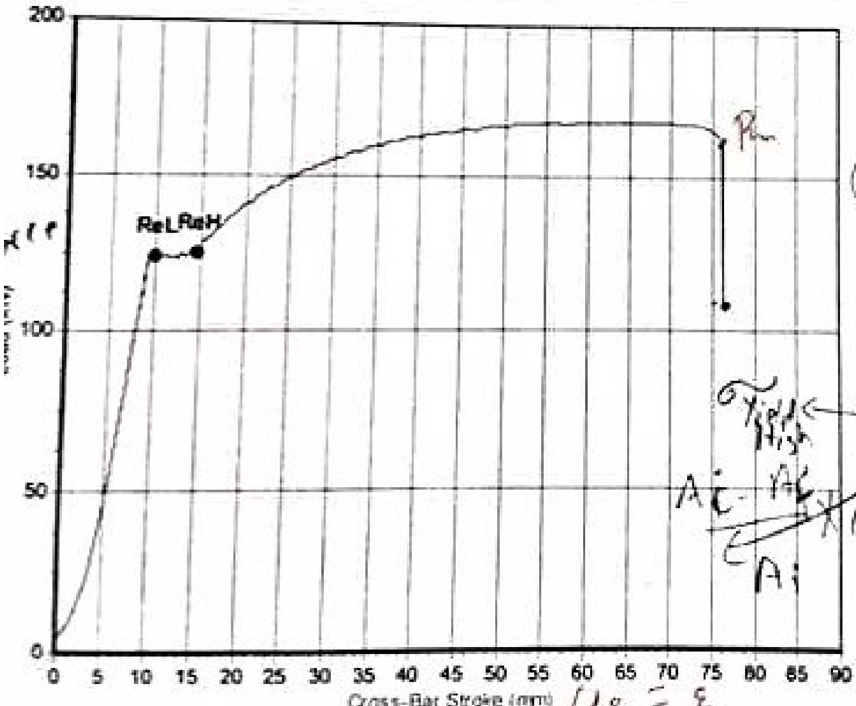
Exp 4
Tensile Test

TENSILE TEST
STANDARD EN 10002/1

Yield

Certificate N°	83	of					
Lot	Acez			Specimen	1/16	of	
	02/03/2016						
Material	St.						
Tooled specimen				Ambient temperature			
Proportional specimen				Drawing position			
				Drawing direction			
Specimen	Round						
Diameter		18.10	mm	Speed 1		9.00	N/mm²/s
				Speed 2		6.00	mm/min
				Lo/Li = 18 cm		180.00	mm
				Le		.00	mm
Preloading time		.00	sec	Lc		262.00	mm
So = Ao		257.304	mm²	Lu final		220.00	mm

Elongation 220 − 180
= 40 mm



/Lo = ε
Stroke Elongation

Tests results

Fracture Stress

Rm		653.846	N/mm²
A	$\frac{\Delta L}{Li}$ %	22.222	%
Fm	Force	168.237	kN
FeL	Force at low Yield	123.706	kN
ReL		480.777	N/mm²
FeH	Force at High	124.805	kN
ReH		485.047	N/mm²
Z		40.173	%

$\frac{Ai - Af}{Ai} \times 100$

$\frac{N}{mm^2}$ = stress

Operator

Manager

Yield Strength